

No. 616,158.

Patented Dec. 20, 1898.

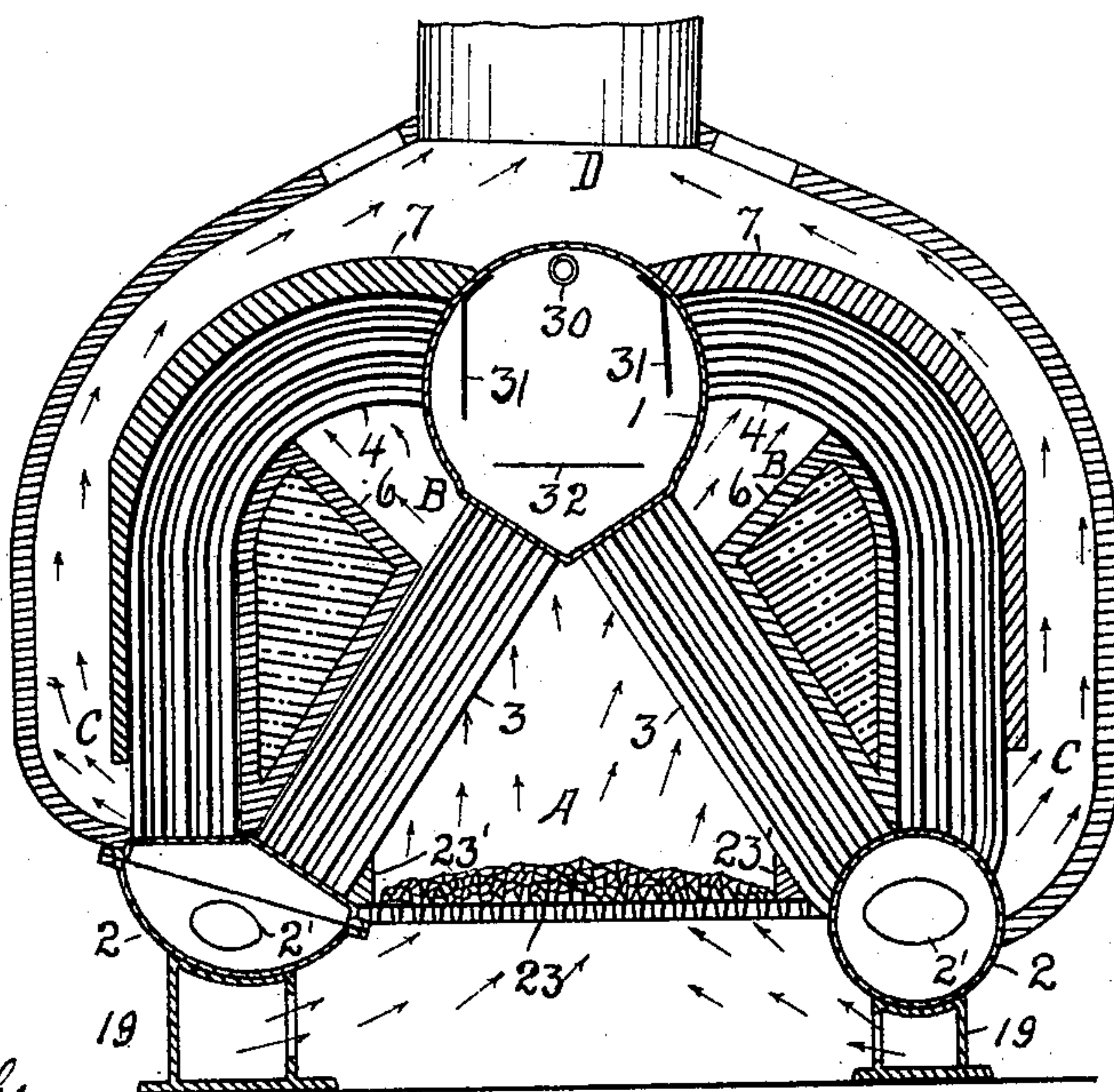
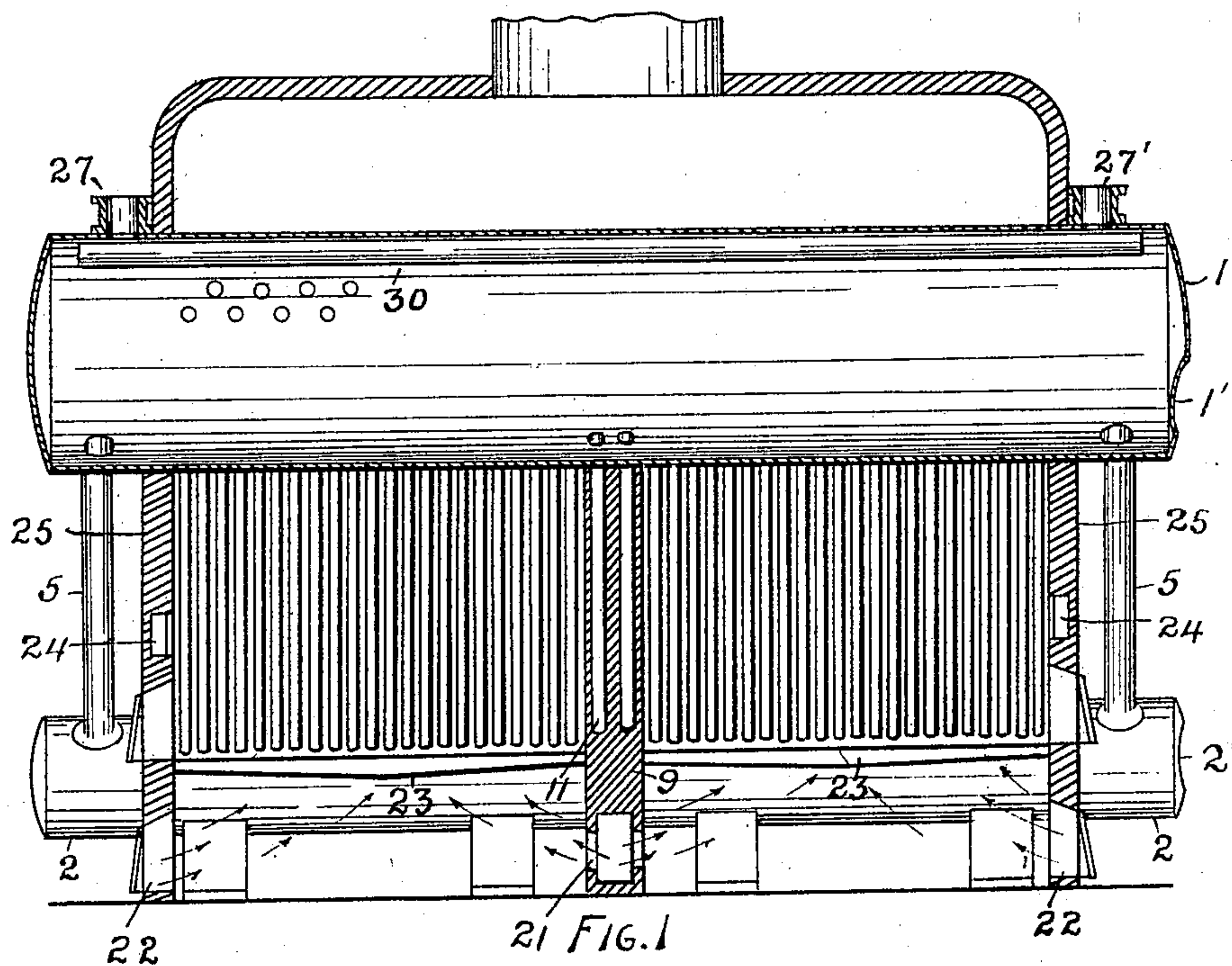
J. A. STEVENS.

STEAM BOILER.

(Application filed July 12, 1898.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

William J. Fisher
J. C. Butler

FIG. 2

BY

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No. 616,158.

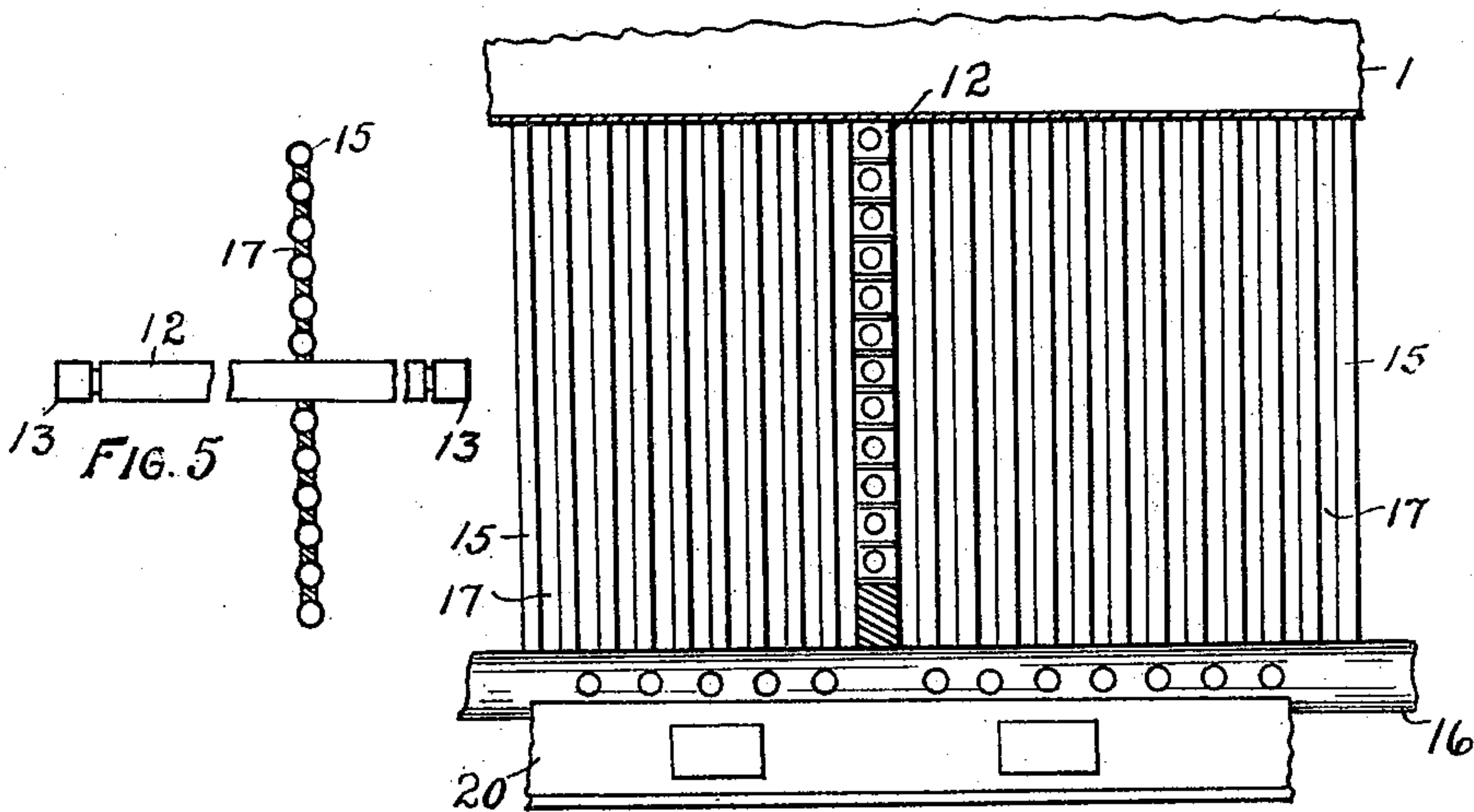
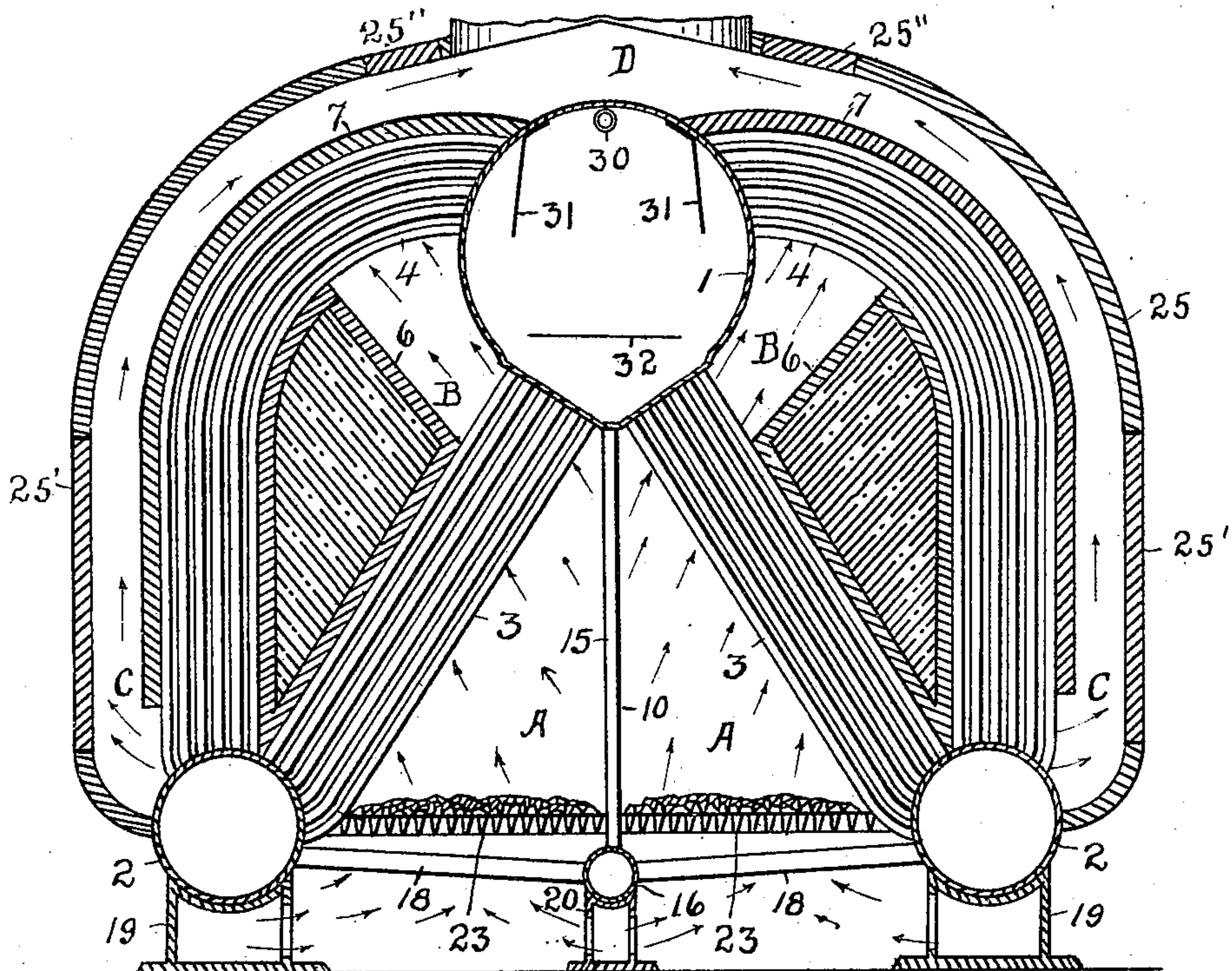
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William J. Fisher
J. E. Butler

INVENTOR

John A. Stevens

BY

Charles A. Butler

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UNITED STATES PATENT OFFICE.

JOHN A. STEVENS, OF LOWELL, MASSACHUSETTS.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 616,158, dated December 20, 1898.

Application filed July 12, 1898. Serial No. 685,803. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. STEVENS, residing at Lowell, in the county of Middlesex, State of Massachusetts, have invented certain
5 new and useful Improvements in Steam-Boilers, of which the following is a specification.

My invention relates to water-tube boilers and furnaces therefor adapted for both land and marine service. Its objects are to provide a compact water-circulating and steam-generating system of large heating-surface in combination with a mode of handling the products of combustion to best develop and utilize the energy of the fuel in the creation
15 of steam, to secure the equal or desired distribution of the heating-gases and cause them to travel in close and constant contact with the heating-surfaces, to effectively focus the gaseous products of combustion, to facilitate the circulation throughout the steam-generating system and avoid condensation, to decrease the danger from accidents, to facilitate cleaning, repairs, and renewals, to so arrange the baffles that they may be changed
25 readily to the form best adapted for securing the most perfect combustion and utilization of the particular fuel employed, and generally to secure a high degree of economy and efficiency in the construction and operation.

30 My invention is illustrated in the accompanying drawings, of which—

Figure 1 is a vertical sectional view on the line *a a* of Fig. 2. Fig. 2 is a vertical sectional view on the line *b b* of Fig. 1. Fig. 3
35 is a vertical sectional view at right angles to the direction of the drums, illustrating a modified form of my invention. Fig. 4 is a detail view, in sectional elevation, illustrating a construction of the division-walls. Fig. 5
40 is a detail sectional plan view illustrating the construction of the division-wall as shown in Fig. 4.

Referring to the drawings, the steam-and-water drum 1 is connected with each of the
45 water-drums 2 by the banks of tubes 3 and 4 and the downcomers 5. Bridge or baffle walls 6, made of any suitable refractory material and having their domes shaped as may be found best adapted for the complete combustion of the fuel employed, are placed between the banks of tubes 3 and 4 and rise from the drums 2. The tubes 3 are shown

straight and the tubes 4 are shown curved; but it will be understood that the tubes 3 may be bent also and that the forms of such tubes
55 may be modified. The bridge-walls are so constructed that they focus the heating-gases, and to this end their forms may readily be remodeled to suit the peculiar fuel employed. Baffles 7 cover the banks of tubes 4 and extend from the drum 1 toward the drums 2,
60 these baffles serving to focus and insulate the heating-gases and direct them downward along the outer banks of tubes. A division-wall 9 (composed of refractory material, water
65 tubes or boxes, or a combination thereof) extends at right angles to the direction of the drums and divides the furnace into two distinct compartments. A second division-wall
70 10 (composed of refractory material, water tubes or boxes, or a combination thereof) extends at right angles to the division-wall 9 and may be employed to further divide the furnace. These division-walls divide the furnace into four distinct compartments, which
75 may be operated independently, or each may be worked while the others are developing full power.

In the construction illustrated in Fig. 1 the division-wall 9 is composed of a combination
80 of refractory material and water-tubes 11, extending between the steam-and-water drum 1 and the water-drums 2; but, as illustrated in Figs. 3, 4, and 5, such division-wall may
85 comprise water-boxes 12, which extend between and are connected with the water-legs 13. These water-legs are designed to extend parallel to the banks of tubes between the drums, as in the case of the tubes. The division-wall 10, as illustrated in Figs. 3, 4, and
90 5, is composed of water-tubes 15, which connect the drum 1 with the drum 16. The spaces between the tubes are closed by the tiles 17. The drums 2 are connected with the drum 16 by the tubes 18.

95 The drums 2 and 16, respectively, rest upon the hollow supports 19 and 20, which serve as air-ducts and are particularly useful in case of forced draft. The duct of the support 20 is arranged to supply air to each side
100 of the division-walls 9 and 10. These ducts, with the ducts 21 in the division-wall 9 and the doors 22, provide updraft for each of the grates 23, while ducts 24 supply air to the

combustion-chamber above the grate. These grates 23 are provided with baffle-walls 23', which protect the adjacent drums and tubes from burning out.

5 The walls 25 surround the furnace and steam-generating system; but the ends of the drums 1 and 2, the downcomers 5, and the connections for the take-off and escape valve 27 and 27' are preferably placed without these
10 walls.

The drum 1 is provided with a dry pipe 30 and plates 31 and 32 to prevent priming and direct the steam along the surface of the drum, assisting in superheating the steam.

15 In the operation the heating-gases rising from the grates 23 pass from the combustion-chambers A into the combustion-chambers B, and thence pass downward along the outer bank of tubes to the escape-passages C, and
20 thence to the breeching D. The baffles focus these gases and direct them along the water-circulating and steam-generating system in direct contact therewith. The flow through the steam-generating and water-circulating
25 system is upward from the water - drums through the banks of tubes to the steam-and-water drum within the furnace and thence downward by the downcomers without the furnace to the water-drums.

30 It will be understood that minor changes may be made without departing from the spirit of my invention and that the usual details of construction may be employed.

Having thus described my invention, I
35 claim as new and desire to secure by Letters Patent—

1. In the combination of a boiler and furnace, a water-drum, a steam-and-water drum, a bank of tubes connecting said water-drum
40 with said steam-and-water drum, a second bank of tubes connecting said water-drum with said steam-and-water drum, a single baffle or bridge wall between said banks of tubes, a combustion-chamber, and means for
45 directing the gaseous products of combustion into contact with said drums and tubes, substantially as specified.

2. In the combination of a boiler and furnace, a water-drum, a steam-and-water drum,
50 one or more downcomers connecting said drums, two banks of tubes connecting said drums, a single baffle or bridge wall between said banks of tubes, said bridge-wall forming with said tubes and steam-and-water drum a
55 combustion - chamber, a main combustion-chamber, and means for directing the gaseous products of combustion into contact with said drums and tubes, substantially as specified.

3. In the combination of a boiler and furnace, a steam-and-water drum, a water-drum,
60 a bank of tubes connecting said drums, a second bank of tubes connecting said drums, a bridge-wall between said banks of tubes, said bridge-wall forming with said tubes and steam-and-water drum a combustion-chamber,
65 a main combustion-chamber, and a baffle above said tubes extending from said steam-

and - water drum toward said water - drum, whereby the gaseous products of combustion are focused and directed into contact with said
70 drums and tubes, substantially as specified.

4. In the combination of a boiler and furnace, a steam-and-water drum, two banks of tubes directly connected therewith and extending to a common point of communication,
75 a single baffle or bridge wall between said banks of tubes, a combustion-chamber formed by said bridge-wall with said tubes and drum, a main combustion-chamber, and means for directing the heating-gases into contact with
80 said tubes and drum, substantially as specified.

5. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, a bank of tubes connecting each of
85 said water-drums with said steam-and-water drum, a second bank of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall between each pair of banks of tubes, a main combustion-chamber,
90 and means for directing the heating-gases into contact with said tubes and drums, substantially as specified.

6. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, two banks of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall between each pair of
95 said banks of tubes, said bridge-walls extending from said water-drums toward said steam-and-water drum, baffles above said banks of tubes and extending from said steam-and-water drum toward said water - drums, and a main combustion-chamber, substantially as
100 specified.

7. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, downcomers connecting said steam-and-water drum with said water-drums, two
105 banks of tubes leading from each of said water-drums to said steam-and-water drum, a bridge-wall extending from each of said water-drums toward said steam-and-water drum between the banks of tubes connecting said drums, baffles located above said banks of
110 tubes and extending from said steam-and-water drum toward said water-drums, a primary combustion - chamber located between said bridge-walls, and a secondary combustion-chamber between each of said bridge-walls
115 and said steam-and-water drum, substantially as specified.

8. In the combination of a boiler and furnace, a steam-and-water drum, two banks of tubes directly connected therewith and extending to a common point of communication,
120 a bridge-wall between said banks of tubes extending toward said drum, a division-wall extending downward from said drum, a main combustion - chamber formed by said walls,
125 and means for directing the gaseous products of combustion therefrom into direct contact with said drums and tubes, substantially as specified.

9. In the combination of a boiler and furnace, a steam-and-water drum, two banks of tubes directly connected therewith and extending to a common point of communication, a bridge-wall between said banks of tubes, a combustion-chamber located between said drum and bridge-wall, a baffle above said banks of tubes and extending downward from said drum, and a division-wall extending downward from said drum and forming with said bridge-wall a main combustion-chamber, substantially as specified.

10. In the combination of a boiler and furnace, a water-drum, a steam-and-water drum, two banks of tubes connecting said drums, a bridge-wall between said banks of tubes and extending from said water-drum toward said steam-and-water drum, a baffle above said tubes and extending from said steam-and-water drum toward said water-drum, a drum and a division-wall comprising water-passages connected therewith and with said steam-and-water drum, a combustion-chamber and a grate therein between said walls, substantially as specified.

11. In the combination of a boiler and furnace, a water-drum, a steam-and-water drum, two banks of tubes connecting said drums, a bridge-wall between said banks of tubes and extending from said water-drum toward said steam-and-water drum, a baffle above said tubes and extending from said steam-and-water drum toward said water-drum, a water-drum and a division-wall comprising water-tubes connected therewith and with said steam-and-water drum, tubes connecting said water-drums, and a combustion-chamber between said walls, substantially as specified.

12. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, two banks of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall extending from each of said water-drums toward said steam-and-water drum, between the corresponding banks of tubes, a division-wall extending downward from said steam-and-water drum and forming with said bridge-walls two combustion-chambers, substantially as specified.

13. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, two banks of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall extending from each of said water-drums toward said steam-and-water drum, between the corresponding banks of tubes, baffles above the said banks of tubes

extending respectively from said steam-and-water drum toward the respective water-drums, and a division-wall forming with said bridge-wall two distinct combustion-chambers, substantially as specified.

14. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, two banks of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall extending from each of said water-drums toward said steam-and-water drum between the corresponding banks of tubes, baffles above said banks of tubes extending from said steam-and-water drum toward the respective water-drums, a drum and a division-wall comprising water-tubes connected with said drum and said steam-and-water drum, and tubes connecting said division-wall drum with said water-drums, substantially as specified.

15. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, two banks of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall extending from each of said water-drums toward said steam-and-water drum, a division-wall substantially parallel to the direction of said bridge-walls, and a division-wall substantially at right angles to the direction of said bridge-walls, said bridge and division walls dividing the furnace into four distinct compartments, substantially as specified.

16. In the combination of a boiler and furnace, a pair of water-drums, a steam-and-water drum, two banks of tubes connecting each of said water-drums with said steam-and-water drum, a bridge-wall extending from each of said water-drums toward said steam-and-water drum between the corresponding banks of tubes, baffles above the banks of tubes extending from said steam-and-water drum toward the respective water-drums, a division-wall substantially parallel to the direction of said bridge-walls, and a division-wall substantially at right angles to the direction of said bridge-walls, said bridge and division walls dividing the furnace into four distinct compartments, substantially as specified.

In testimony whereof I have hereunto set my hand in the presence of the subscribing witnesses.

JNO. A. STEVENS.

Witnesses:

GEO. M. STEVENS,
W. E. CARLSTON.